ALG 1B
Algebra I, Second Semester
PR-10256, BK-10257 (v.3.0)

To the Student:

After your registration is complete and your proctor has been approved, you may take the Credit by Examination for ALG 1B.

WHAT TO BRING

- several sharpened No. 2 pencils
- graphing calculator
- straightedge ruler
- extra sheets of scratch paper

ABOUT THE EXAM

The examination for the second semester of Algebra I consists of 40 questions, of which 35 are multiple choice and the rest are short answer. The exam is based on the Texas Essential Knowledge and Skills (TEKS) for this subject. The full list of TEKS is included in this document (it is also available online at the Texas Education Agency website, http://www.tea.state.tx.us/). The TEKS outline specific topics covered in the exam, as well as more general areas of knowledge and levels of critical thinking. Use the TEKS to focus your study in preparation for the exam.

The examination will take place under supervision, and the recommended time limit is three hours. You may not use any notes or books. A percentage score from the examination will be reported to the official at your school.

In preparation for the examination, review the TEKS for this subject. All TEKS are assessed. A list of review topics is included in this document to focus your studies. It is important to prepare adequately. Since questions are not taken from any one source, you can prepare by reviewing any of the state-adopted textbooks that are used at your school. The textbook used with our ALG 1B course is:

Larson, R., & Boswell, L. (2016). *Big Ideas Math, Algebra 1.* Earie, PA: Big Ideas Learning, LLC. ISBN 978-1-60840-814-6

The practice exam included in this document will give you a model of the types of questions that will be asked on your examination. It is **not** a duplicate of the actual examination. It is provided to illustrate the format of the exam, not to serve as a complete review sheet. A formula chart will be provided to you for use on your exam.

Good luck on your examination!

CONCEPTS

The following is a list of concepts covered in Algebra I 1B and offers a view of topics that need to be studied, reviewed, and learned for this assessment.

- Apply mathematics to problems arising in everyday life, society, and the workplace.
- Use a problem-solving model that incorporates analyzing given information, formulating a solving process and the reasonableness of the solution plan or strategy, determining a solution, justifying the solution, and evaluating the problem.
- Select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems.
- Communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate.
- Create and use representations to organize, record, and communicate mathematical ideas.
- Analyze mathematical relationships to connect and communicate mathematical ideas.
- Display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.
- Write linear equations in two variables given a table of values, a graph, and a verbal description.
- Determine the domain and range of quadratic functions and represent the domain and range using inequalities.
- Write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form $\left(f\left(x\right)=a\left(x-h\right)^2+k\right)$, and rewrite the equation from vertex form to standard form $\left(f\left(x\right)=ax^2+bx+c\right)$.
- Write quadratic functions when given real solutions and graphs of their related equations.
- Graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including *x*-intercept, *y*-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry.
- Describe the relationship between the linear factors of quadratic expressions and the zeros of their associated quadratic functions.

- Determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, $f(bx)$ for specific values of *a*, *b*, *c,* and *d*.

- Solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula.

- Write, using technology, quadratic functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems.

- Determine the domain and range of exponential functions of the form $f(x) = ab^x$ and represent the domain and range using inequalities.

- Interpret the meaning of the values of *a* and *b* in exponential functions of the form $f(x) = ab^x$ in real-world problems.

- Write exponential functions in the form $f(x) = ab^x$ (where *b* is a rational number) to describe problems arising from mathematical and real-world situations, including growth and decay.

- Graph exponential functions that model growth and decay and identify key features, including *y*-intercept and asymptote, in mathematical and real-world problems.

- Write, using technology, exponential functions that provide a reasonable fit to data and make predictions for real-world problems.

- Add and subtract polynomials of degree one and degree two.

- Multiply polynomials of degree one and degree two.

- Determine the quotient of a polynomial of degree one and polynomial of degree two when divided by a polynomial of degree one and polynomial of degree two when the degree of the divisor does not exceed the degree of the dividend.

- Rewrite polynomial expressions of degree one and degree two in equivalent forms using the distributive property.

- Factor, if possible, trinomials with real factors in the form $ax^2 + bx + c$, including perfect square trinomials of degree two.

- Decide if a binomial can be written as the difference of two squares and, if possible, use the structure of a difference of two squares to rewrite the binomial.

- Simplify numerical radical expressions involving square roots.

- Simplify numeric and algebraic expressions using the laws of exponents, including integral and rational exponents.

- Identify terms of arithmetic and geometric sequences when the sequences are given in function form using recursive processes.

- Write a formula for the n^{th} term of arithmetic and geometric sequences, given the value of several of their terms.

ALG 1B Formula Chart

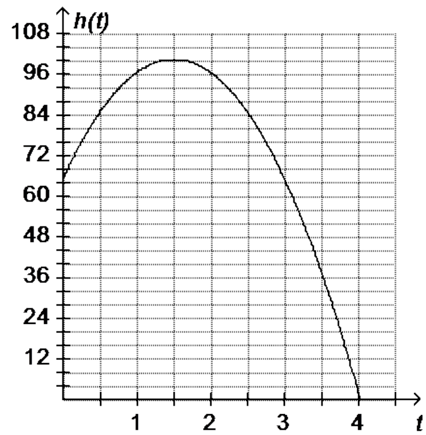
FACTORING	
Perfect square trinomials	$a^2 + 2ab + b^2 = (a+b)^2$ $a^2 - 2ab + b^2 = (a-b)^2$
Difference of squares	$a^2 - b^2 = (a-b)(a+b)$
PROPERTIES OF EXPONENTS	
Product of powers	$a^m a^n = a^{(m+n)}$
Quotient of powers	$\frac{a^m}{a^n} = a^{(m-n)}$
Power of a power	$(a^m)^n = a^{mn}$
Rational exponent	$a^{\frac{m}{n}} = \sqrt[n]{a^m}$
Negative exponent	$a^{-n} = \frac{1}{a^n}$
LINEAR EQUATIONS	
Standard form	$Ax + By = C$
Slope-intercept form	$y = mx + b$
Point-slope form	$y - y_1 = m(x - x_1)$
Slope of a line	$m = \frac{y_2 - y_1}{x_2 - x_1}$
QUADRATIC EQUATIONS	
Standard form	$f(x) = ax^2 + bx + c$
Vertex form	$f(x) = a(x-h)^2 + k$
Quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Axis of symmetry	$x = \frac{-b}{2a}$

ALG 1B Practice Exam

Multiple Choice. Choose the best answer for each question. Show your work on the exam or on scratch paper. (2 points each)

Check your answers with the answer key provided.

1. The function $h(t)$ gives the height in feet of a ball t seconds after it is thrown upward from the roof of a 64-foot tall building. How many seconds after the ball is thrown does it reach its maximum height? What is the ball's maximum height?



   A. The ball reaches a maximum height of 64 feet 0 seconds after it is thrown.
   B. The ball reaches a maximum height of 96 feet 1 second after it is thrown.
   C. The ball reaches a maximum height of 100 feet 1.5 seconds after it is thrown.
   D. The ball reaches a maximum height of 104 feet 1.5 seconds after it is thrown.

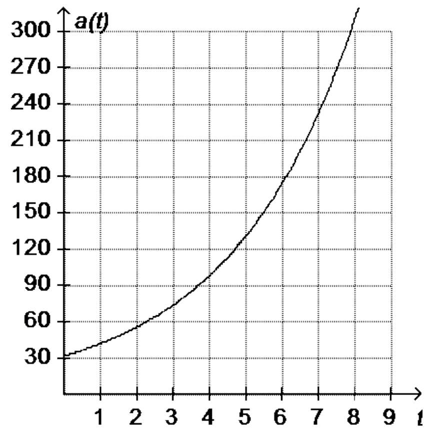
2. Which equation below allows you to solve $2x^2 - 15 = x$ using the zero product property?

   A. $(2x + 5)(x - 3) = 0$
   B. $(2x - 5)(x - 3) = 0$
   C. $(2x + 5)(x + 3) = 0$
   D. $(2x - 5)(x + 3) = 0$

3. Asako deposits \$1,000 into a bank account that pays 1.5% interest compounded annually. Which inequality can she use to determine the minimum time in years t she needs to wait before the value of the account is 20% more than its original value?

   A. $1{,}000 \bullet 1.015t > 1{,}200$
   B. $1{,}000 \bullet 1.015t > 1.2$
   C. $1.015^t > 1{,}200$
   D. $1.015^t > 1.2$

4. A website allows its users to submit and edit content in an online encyclopedia. The graph shows the number of articles $a(t)$ in the encyclopedia t months after the website went live. How many articles were in the encyclopedia when it went live?



A. 0
B. 30
C. 60
D. 180

5. Which ordered pairs satisfy an exponential function?

A.

x	–4	–3	–2	–1
y	0	5	0	–25

B.

x	4	3	2	1
y	81	27	9	1

C.

x	4	3	2	1
y	64	27	8	1

D.

x	4	3	2	1
y	4	2	0	–2

continued →

6. In which of the following situations does Michael's salary change at a constant rate relative to the year?

   A. Michael's starting salary is \$9,500 and increases by 4% each year.
   B. Michael's starting salary is \$9,500 and increases by \$500 each year.
   C. Michael's starting salary is \$9,500. He receives a \$500 raise after one year and a \$600 raise after the second year.
   D. Michael's starting salary is \$9,500. He receives a 4% raise after one year and a 5% raise after the second year.

7. If $2x^2 - 5x + 7$ is subtracted from $4x^2 + 2x - 11$, what is the coefficient of x in the result?

   A. 2
   B. 7
   C. –3
   D. –18

8. Write the radical expression in rational exponent form.

   $$\sqrt[3]{k^7}$$

   A. $k^{\frac{7}{3}}$
   B. $k^{\frac{3}{7}}$
   C. k^4
   D. k^3

Short Answer. For each question, show your work in the space provided and circle your answer. (6 points each)

9. Rewrite $g\left(x\right) = -3x^2 - 3x + 3\frac{1}{4}$ in vertex form. What is the maximum or minimum value that the graph of the function takes?

10. Solve.

    $$x^2 - 7x + 12 = 0$$

ALG 1B Practice Exam Answer Key

1. C

   The ball achieves its maximum height at the vertex of the parabola that represents $h(t)$. The vertex of the parabola is (1.5, 100). So, the ball reaches a maximum height of 100 feet 1.5 seconds after it is thrown.

2. A

$$
\begin{aligned}
2x^2 - 15 &= x \\
2x^2 - x - 15 &= 0 \\
(2x+5)(x-3) &= 0
\end{aligned}
$$

3. D

   Asako wants to determine when she has more than $1,200 in her bank account. Since the interest compounds annually, after t years she will have $1{,}000 \bullet 1.015^t$ in the account. Thus, the appropriate inequality is $1{,}000 \bullet 1.015^t > 1{,}200$, which simplifies to $1.015^t > 1.2$.

   Remember that compound interest is represented by an exponential expression. Do not compare the rate of growth with the total amount of money.

4. B

   The website went live when $t = 0$, so the $a(t)$-intercept will give the number of articles. The $a(t)$-intercept is 30. There were 30 articles in the encyclopedia when it went live.

5. B

6. B

   If Michael's salary changes at a constant rate relative to time in years, then the change must be the same every year. The only situation that reflects this is if Michael's starting salary is $9,500 and increases by $500 each year.

continued →

7. B

$$4x^2+2x-11-\left(2x^2-5x+7\right)=4x^2+2x-11-2x^2+5x-7$$
$$=4x^2-2x^2+2x+5x-11-7$$
$$=2x^2+7x-18$$

The coefficient of the x-term in $2x^2+7x-11$ is 7.

8. A

$\sqrt[n]{a^m}=a^{\frac{m}{n}}$, so $\sqrt[3]{k^7}=k^{\frac{7}{3}}$

9. $g\left(x\right)=-3x^2-3x+3\frac{1}{4}$

$g\left(x\right)=-3\left(x^2+x\right)+3\frac{1}{4}$

$g\left(x\right)=-3\left(x^2+x+\frac{1}{4}\right)+\frac{13}{4}+\frac{3}{4}$

$g\left(x\right)=-3\left(x+\frac{1}{2}\right)^2+4$

maximum of 4

10. $x^2-7x+12=0$

$\left(x-3\right)\left(x-4\right)=0$

$x-3=0 \qquad x-4=0$

$x=3 \qquad x=4$

Texas Essential Knowledge and Skills
ALG 1B – Algebra I, Second Semester

§111.39. Implementation of Texas Essential Knowledge and Skills for Algebra I (One Half Credit), Beginning with School Year 2012.

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grade 8 or 9. Prerequisite: Mathematics, Grade 8 or its equivalent.

(b) Introduction.

(1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on fluency and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.

(2) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) In Algebra I, students will build on the knowledge and skills for mathematics in Grades 6–8, which provide a foundation in linear relationships, number and operations, and proportionality. Students will study linear, quadratic, and exponential functions and their related transformations, equations, and associated solutions. Students will connect functions and their associated solutions in both mathematical and real-world situations. Students will use technology to collect and explore data and analyze statistical relationships. In addition, students will study polynomials of degree one and two, radical expressions, sequences, and laws of exponents. Students will generate and solve linear systems with two equations and two variables and will create new functions through transformations.

(4) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(2) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. The student is expected to:

(A) determine the domain and range of a linear function in mathematical problems; determine reasonable domain and range values for real-world situations, both continuous and discrete; and represent domain and range using inequalities;

(B) write linear equations in two variables in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$, given one point and the slope and given two points;

(C) write linear equations in two variables given a table of values, a graph, and a verbal description;

(D) write and solve equations involving direct variation;

(E) write the equation of a line that contains a given point and is parallel to a given line;

(F) write the equation of a line that contains a given point and is perpendicular to a given line;

(G) write an equation of a line that is parallel or perpendicular to the *X* or *Y* axis and determine whether the slope of the line is zero or undefined;

(H) write linear inequalities in two variables given a table of values, a graph, and a verbal description; and

(I) write systems of two linear equations given a table of values, a graph, and a verbal description.

(3) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. The student is expected to:

(A) determine the slope of a line given a table of values, a graph, two points on the line, and an equation written in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$;

(B) calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems;

(C) graph linear functions on the coordinate plane and identify key features, including x-intercept, y-intercept, zeros, and slope, in mathematical and real-world problems;

(D) graph the solution set of linear inequalities in two variables on the coordinate plane;

(E) determine the effects on the graph of the parent function $f(x) = x$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, $f(bx)$ for specific values of a, b, c, and d;

(F) graph systems of two linear equations in two variables on the coordinate plane and determine the solutions if they exist;

(G) estimate graphically the solutions to systems of two linear equations with two variables in real-world problems; and

(H) graph the solution set of systems of two linear inequalities in two variables on the coordinate plane.

(4) Linear functions, equations, and inequalities. The student applies the mathematical process standards to formulate statistical relationships and evaluate their reasonableness based on real-world data. The student is expected to:

(A) calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity as a measure of the strength of the linear association;

(B) compare and contrast association and causation in real-world problems; and

(C) write, with and without technology, linear functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems.

(5) Linear functions, equations, and inequalities. The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions. The student is expected to:

(A) solve linear equations in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides;

(B) solve linear inequalities in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides; and

(C) solve systems of two linear equations with two variables for mathematical and real-world problems.

(6) Quadratic functions and equations. The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations. The student is expected to:

(A) determine the domain and range of quadratic functions and represent the domain and range using inequalities;

(B) write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form ($f(x) = a(x - h)^2 + k$), and rewrite the equation from vertex form to standard form ($f(x) = ax^2 + bx + c$); and

(C) write quadratic functions when given real solutions and graphs of their related equations.

(7) Quadratic functions and equations. The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations. The student is expected to:

(A) graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry;

(B) describe the relationship between the linear factors of quadratic expressions and the zeros of their associated quadratic functions; and

(C) determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, $f(bx)$ for specific values of a, b, c, and d.

(8) Quadratic functions and equations. The student applies the mathematical process standards to solve, with and without technology, quadratic equations and evaluate the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. The student is expected to:

(A) solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula; and

(B) write, using technology, quadratic functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems.

(9) Exponential functions and equations. The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. The student is expected to:

(A) determine the domain and range of exponential functions of the form $f(x) = abx$ and represent the domain and range using inequalities;

(B) interpret the meaning of the values of a and b in exponential functions of the form $f(x) = abx$ in real-world problems;

(C) write exponential functions in the form $f(x) = abx$ (where b is a rational number) to describe problems arising from mathematical and real-world situations, including growth and decay;

(D) graph exponential functions that model growth and decay and identify key features, including y-intercept and asymptote, in mathematical and real-world problems; and

(E) write, using technology, exponential functions that provide a reasonable fit to data and make predictions for real-world problems.

(10) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions. The student is expected to:

(A) add and subtract polynomials of degree one and degree two;

(B) multiply polynomials of degree one and degree two;

(C) determine the quotient of a polynomial of degree one and polynomial of degree two when divided by a polynomial of degree one and polynomial of degree two when the degree of the divisor does not exceed the degree of the dividend;

(D) rewrite polynomial expressions of degree one and degree two in equivalent forms using the distributive property;

(E) factor, if possible, trinomials with real factors in the form $ax^2 + bx + c$, including perfect square trinomials of degree two; and

(F) decide if a binomial can be written as the difference of two squares and, if possible, use the structure of a difference of two squares to rewrite the binomial.

(11) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to rewrite algebraic expressions into equivalent forms. The student is expected to:

(A) simplify numerical radical expressions involving square roots; and

(B) simplify numeric and algebraic expressions using the laws of exponents, including integral and rational exponents.

(12) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. The student is expected to:

(A) decide whether relations represented verbally, tabularly, graphically, and symbolically define a function;

(B) evaluate functions, expressed in function notation, given one or more elements in their domains;

(C) identify terms of arithmetic and geometric sequences when the sequences are given in function form using recursive processes;

(D) write a formula for the nth term of arithmetic and geometric sequences, given the value of several of their terms; and

(E) solve mathematic and scientific formulas, and other literal equations, for a specified variable.

Source: The provisions of this §111.39 adopted to be effective September 10, 2012, 37 TexReg 7109.